

CLAIMS

1. A method for detecting an impending seizure in a neural system, comprising:
applying an electrical stimulus consisting of low frequency content to a
neural system,
5 detecting the response of the neural system to the stimulus, and
determining whether the response is different from a response during the
interictal state, whereby an impending seizure is detected.
2. A method of claim 1, wherein said electrical stimulus is subthreshold.
- 10 3. A method of claim 1, wherein said electrical stimulus is a continuous
waveform.
4. A method of claim 1, wherein said electrical stimulus comprises an arbitrary
15 waveform that is determined adaptively by the magnitude and frequency of a
preceding or concurrent response.
5. A method for detecting an impending seizure in a neural system, comprising:
applying a subthreshold electrical stimulus to a neural system,
20 detecting the response of the neural system to the stimulus, and
determining whether the response is different from a response during the
interictal state, whereby an impending seizure is detected.
6. A method of claim 5, wherein said electrical stimulus consists of low
25 frequency content.
7. A method of claim 5, wherein said electrical stimulus is a continuous
waveform.

8. A method of claim 5, wherein said electrical stimulus comprises an arbitrary waveform that is determined adaptively by the magnitude and frequency of a preceding or concurrent response.
- 5 9. A method for detecting an impending seizure in a neural system, comprising:
applying an electrical stimulus consisting of a continuous waveform to a neural system,
detecting the response of the neural system to the stimulus, and
determining whether the response is different from a response during the
10 interictal state, whereby an impending seizure is detected.
10. A method of claim 9, wherein said electrical stimulus consists of low frequency content.
- 15 11. A method of claim 9, wherein said electrical stimulus is subthreshold.
12. A method of claim 9, wherein said electrical stimulus comprises an arbitrary waveform that is determined adaptively by the magnitude and frequency of a preceding response.
- 20 13. A method for detecting an impending seizure in a neural system, comprising:
applying an electrical stimulus to a neural system, wherein said electrical stimulus comprises an arbitrary waveform that is determined adaptively by the magnitude and frequency of a preceding or concurrent response,
25 detecting the response of the neural system to the stimulus, and
determining whether the response is different from a response during the interictal state, whereby an impending seizure is detected.
14. A method of claim 13, wherein said electrical stimulus consists of low frequency content.
- 30 15. A method of claim 13, wherein said electrical stimulus is subthreshold.

16. A method of claim 13, wherein said electrical stimulus is a continuous waveform.
- 5 17. A method of claim 1, wherein the stimulus is characterized by voltage, current, or field strength.
18. A method of claim 1, wherein the stimulus is less than 1000 mV/mm.
- 10 19. A method of claim 1, wherein the stimulus is oriented parallel to the somatic-dendritic axis of the neurons in the neural system.
20. A method of claim 1, wherein the stimulus is an electrical field produced using two field electrodes positional external to the neurons in the neural system.
- 15 21. A method of claim 1, wherein a plurality of stimuli are applied and the interval between each stimulus is more than 1 second.
22. A method of claim 1, wherein the detecting the response is measuring neuronal activity of the neural system.
- 20 23. A method of claim 22, wherein the measuring of the neuronal activity is performed simultaneously and continuously with the applied stimulus.
- 25 24. A method of claim 22, wherein the neuronal activity is characterized by root-mean-square.
25. A method of claim 1, wherein the frequency and amplitude of the applied stimulus is insufficient to evoke action potentials in the neurons that comprise
- 30 said neural system.

26. A method of claim 1, further comprising, when a impending or pre-seizure state is detected,
- 5 applying an oriented electric field or current to said neural system effective to suppress the seizure activity of the neural system, wherein the magnitude and polarity of said oriented electric field is changed in response to the measured neuronal activity, and the measuring of neuronal activity is performed simultaneously and continuously with the applied field.
27. A method for detecting a pre-seizure state in a neural system, comprising:
- 10 applying a stimulus having a waveform comprising a positive, negative, and zero phases, to a neural system,
- detecting the response of the neural system to the stimulus, and
- determining whether the responses to each of said phases of the stimulus differ from responses to each of said phases during non-pre-seizure times,
- 15 whereby a pre-seizure state is detected.
28. A method for detecting a change in the state of a neural system, comprising:
- applying a stimulus to a neural system,
- detecting the response of the neural system to the stimulus, and
- 20 determining whether the response to the stimulus is different from a previous response to a stimulus.